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Nebraska Tractor Tests

Tractor Test and Power Museum, The Lester F.  
Larsen

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5-21-1957

## Test 618: International 650 Gasoline

Tractor Test & Power Museum

University of Nebraska, jsteele4@unl.edu

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The Experiment Station  
University of Nebraska College of Agriculture  
W. V. Lambert, Director, Lincoln, Nebraska

Department of Agricultural Engineering  
Dates of test: May 3, 1957 to May 21, 1957  
Manufacturer: INTERNATIONAL HARVESTER  
COMPANY, CHICAGO, ILLINOIS  
Manufacturer's rating: Not Rated

NEBRASKA TRACTOR TEST NO. 618

INTERNATIONAL 650

BELT HORSEPOWER TESTS

Hp	Crank shaft speed rpm	Fuel Consumption			Temp. Deg. F.			Barometer inches of mercury		
		Gal per hr	Hp-hr per gal	Lb per hp-hr	Cooling medium	Air wet bulb	Air dry bulb			
TEST B—100% MAXIMUM LOAD—TWO HOURS										
62.11	1500	6.006	10.34	0.591	176	58	79	29.032		
TEST C—OPERATING MAXIMUM LOAD—ONE HOUR										
58.96	1500	5.102	11.56	0.529	197	57	74	29.020		
TEST D—RATED LOAD—ONE HOUR										
55.43	1500	4.849	11.43	0.535	192	55	70	29.028		
TEST E—VARYING LOAD—TWO HOURS (20 minute runs; last line average)										
55.46	1501	4.855	11.42	0.535	191	55	68	.....		
0.91	1580	1.969	0.46	13.220	178	54	66	.....		
28.69	1544	3.451	8.31	0.735	184	55	66	.....		
58.13	1459	4.978	11.68	0.523	199	54	66	.....		
14.59	1566	2.705	5.39	1.133	179	55	67	.....		
42.51	1527	4.163	10.21	0.598	193	54	66	.....		
33.38	1529	3.687	9.05	0.675	187	54	66	29.015		
TEST L—OPERATING MAXIMUM TORQUE										
% of rated rpm (engine)	100	95	90	85	80	75	70	65	60	55
% of rated-speed torque	100	103	105	107	108	110	112	113	113	112

DRAWBAR HORSEPOWER TESTS

Hp	Draw bar pull lbs	Speed miles per hr	Crank shaft speed rpm	Slip of drive wheels %	Fuel Consumption			Temp. Deg. F.			Barometer inches of mercury
					Gal per hr	Hp-hr per gal	Lb per hp-hr	Cooling med	Air wet bulb	Air dry bulb	
TEST H—RATED LOAD—TEN HOURS—3rd Gear											
44.66	3722	4.50	1500	4.09	4.559	9.80	0.624	178	63	77	28.725
TEST F—100% MAXIMUM LOAD											
56.17	4708	4.47	1501	4.65	3rd gear . . . . .			166	52	55	28.900
TEST G—OPERATING MAXIMUM LOAD											
50.09	8564	2.19	1501	11.38	1st gear . . . . .			168	51	55	28.920
52.66	6329	3.12	1501	6.36	2nd gear . . . . .			177	52	55	28.900
53.18	4435	4.50	1503	4.30	3rd gear . . . . .			186	52	55	28.900
52.87	3597	5.51	1503	3.73	4th gear . . . . .			177	52	56	28.920
43.99	1009	16.35	1502	0.88	5th gear . . . . .			196	54	58	28.980
TEST J—OPERATING MAXIMUM LOAD											
53.01	4480	4.44	1500	6.87	3rd gear . . . . .			172	54	62	28.815
TEST K—OPERATING MAXIMUM LOAD											
43.97	4064	4.06	1505	14.75	3rd gear (prt-thrtl) . .			193	54	62	28.840

TIRES, WHEELS AND WEIGHT

	Tests F, G, & H	Test J	Test K
Rear wheels			
Type	Cast iron	Cast iron	Cast iron
Liquid ballast	1560 lb each	None	None
Added cast iron	280 lb each	None	None
Rear tires			
No. and size	Two 18-26	Two 18-26	Two 14-34
Ply	8	8	6
Air pressure	16 lb	16 lb	16 lb
Front wheels			
Type	Cast iron	Cast iron	Cast iron
Liquid ballast	None	None	None
Added cast iron	None	None	None
Front tires			
No. and size	Two 7.50-18	Two 7.50-18	Two 7.50-18
Ply	4	4	4
Air pressure	24 lb	24 lb	24 lb
Height of drawbar	19 inches	20½ inches	20½ inches
Static weight			
Rear end	9810 lb	6130 lb	4520 lb
Front end	2630 lb	2620 lb	2624 lb
Total weight as tested with operator	12,615 lb	8925 lb	7319 lb

**FUEL, OIL, WATER and TIME** Fuel Gasoline Oc-  
tane No. ASTM 82 Research 88 (rating taken from oil  
company's typical inspection data) Weight per gal-  
lon 6.111 lb Oil SAE 20-20W To motor 3.160 gal  
Drained from motor 2.365 gal Water used 1.182 gal  
Total time motor was operated 52 hours.

**CHASSIS** Type Standard Serial No. 1062J Tread  
width rear 60" front 52" Wheel base 83.4" Hy-  
draulic control system direct engine drive Advertised  
speeds mph first 2.4 second 3.2 third 4.5 fourth 5.5  
fifth 15.7 reverse 2.9 Belt pulley diam. 14" face  
8½" rpm 707 Belt speed 2593 fpm Belt flat Length  
75' Width 8" Thickness 0.216" Maximum slip  
0.95% Clutch single plate dry disc operated by foot  
pedal Seat upholstered seat on conical spring with  
shock absorber Brakes double disc operated by two  
foot pedals Equalized by locking pedals together  
Power take-off conventional type Steering hydraulically  
aided.

**ENGINE** Make International Type 4 cylinder ver-  
tical Serial No. C-350 540 Crankshaft mounted  
lengthwise Head I Lubrication pressure Bore and  
stroke 4.5" x 5.5" Rated rpm 1500 Compression  
ratio 6.12 to 1 Displacement 350 cu. in. Valve port  
diameter Inlet 1½" Exhaust 1 11/16" Governor  
variable speed centrifugal Carburetor size 1½" Igni-  
tion system battery Starting system 12 volt battery  
Air cleaner oil washed wire screen Muffler was used  
Oil filter replaceable treated paper element Cooling  
medium temperature control thermostat and radiator  
shutter.

**REPAIRS AND ADJUSTMENTS** No repairs or ad-  
justments.

**REMARKS** All test results were determined from  
observed data and without allowances, additions or  
deductions. Tests B and F were made with carbu-  
retor set for 100% maximum belt horsepower and  
data from these tests were used in determining the  
horsepower to be developed in tests D and H, re-  
spectively. Tests C, D, E, G, H, J, K, and L were  
made with an operating setting of the carburetor (se-  
lected by the manufacturer) of 94.5% of maximum  
belt horsepower.

HORSEPOWER SUMMARY

	Drawbar	Belt
1. Sea level (calculated) maximum horsepower (based on 60° F. and 29.92" Hg)	57.87	65.17
2. Observed maximum horsepower (tests F and B)	56.17	62.11
3. Seventy-five per cent of calculated maximum drawbar horsepower and eighty-five per cent of calculated maximum belt horsepower (ASAE and SAE ratings)	43.40	55.39

We, the undersigned, certify that this is a true  
and correct report of official Tractor Test No. 618.

L. F. LARSEN  
Engineer-in-Charge

L. W. HURLBUT, Chairman  
G. W. STEINBRUEGGE  
J. J. SULEK  
Board of Tractor  
Test Engineers

## EXPLANATION OF TEST REPORT

**TEST A:** The manufacturer's representative operates the tractor for a minimum of 12 hours using light to heavy drawbar loads in each gear.

This serves as a period for limber up, general observation and adjustments. Adjustments that are permissible include valve tappet clearance, breaker point gap, spark plug gaps, clutch and others of a similar nature. No new parts or accessories can be installed without having mention made of it in the report.

No data are recorded during this preliminary run except the time that the engine is operated.

### BELT HORSEPOWER TESTS

**TEST B:** The throttle valve is wide open and the belt load on the dynamometer is adjusted so that the engine is at the rated speed recommended by the manufacturer. Carburetor, ignition timing and manifold adjustments are all set for maximum engine power.

This test is designed to determine maximum belt horsepower of the tractor at rated speed and to measure fuel consumption at the maximum power on the belt.

**TEST C:** For tractors with carburetors the best fuel economy does not always occur when the engine develops maximum power at rated speed. Test C is intended to allow the manufacturer's representative to select a more economical fuel setting even though there is a slight loss of power. *This more practical carburetor setting is used in all later tests except test F.* The throttle valve is wide open and load adjusted to give rated rpm. Tests B and C are the same for diesel tractors which have an altogether different fuel system.

**TEST D:** The throttle control lever is set so that the governor will maintain rated engine speed when rated load is applied. Rated load is 85% of 100% maximum, as obtained in test B, corrected to standard conditions.

This rating is somewhat less than the maximum belt horsepower in order that the operator may have a certain amount of reserve.

### TEST E:

**Varying load** serves to show the range of engine speeds when the engine is controlled by the governor during the following varied loads, of 20 minutes each; rated load, no load,  $\frac{1}{2}$  rated load, maximum load at wide open throttle valve,  $\frac{1}{4}$  and  $\frac{3}{4}$  rated load.

The average result of this test shows the average power and fuel consumption. Since the average tractor is subjected to varying loads, these data serve well in predicting fuel consumption and efficiency of a tractor in general use.

**TEST L:** This torque test is run with wide open throttle. Loads are applied to reduce engine speed in approximately ten 5% increments. Rated speed equals 100%. The corresponding dynamometer torque is recorded as a per cent of torque at rated speed.

### DRAWBAR HORSEPOWER TESTS

In all drawbar tests the pull exerted by the tractor is transmitted by a hydraulic pressure cylinder to a recording instru-

ment in the test car. When rubber tires are used, all tests are made on the concrete test course. All crawler type tractors are tested on a dirt test course which is maintained by grading, sprinkling and rolling so that it remains very nearly the same throughout the season. The same tires, wheels and weights are used for all tests except J and K.

**TEST F:** A drawbar test, the results of which are used to determine the rated drawbar horsepower in test H. The carburetor is set to develop maximum power as in test B. The rated gear recommended by manufacturer as plow gear is used in this test. The drawbar load is adjusted to give rated engine speed.

**TEST G:** Maximum drawbar horsepower is determined in each gear when the carburetor is set for fuel economy as in test C. The throttle valve is held wide open and the load is applied so that the engine runs at rated engine speed.

When operating in low gear it is not uncommon for the tractor to develop less drawbar horsepower than in rated gear because of excessive wheel slippage. When excessive wheel slippage occurs the load is reduced until slippage approaches 16%. When the load is reduced it is necessary to operate the tractor engine at part throttle and control engine speed by governor action.

**TEST H:** Intended to test the ability of the tractor to run continuously for 10 hours at rated drawbar horsepower and to determine the fuel consumption during that time. Rated drawbar horsepower is 75% of 100% maximum drawbar horsepower (Test F), corrected to standard conditions.

When operating at rated load the throttle control lever is set to maintain rated engine speed. This rating is less than maximum drawbar horsepower in order that the operator may have a certain amount of reserve.

**TEST J:** The tractor is operated in rated gear with all added weight removed. This test shows the effect of the removal of added weight on the performance of the tractor when compared with test G.

Removal of wheel weights generally increases wheel slippage and decreases drawbar horsepower.

**TEST K:** Similar to test J except that the smallest tires and lightest wheels offered by the manufacturer are used.

